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(54)[Title of the Invention]

Toilet Sand for Pet

(57)[Abstract]

[Purpose]

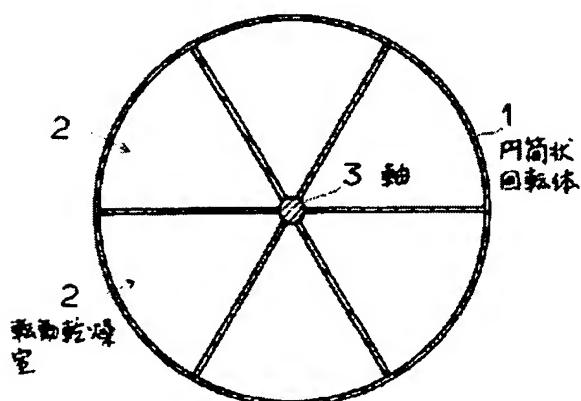
To offer toilet sand having a high lump-forming function by urine, a high urine absorption, and a high deodorizing function, and being light-weight.

[Composition]

Finely pulverized sodium bentonite (swelling degree of 22 cc/2g) and calcium bentonite are mixed at the ratio of 1:1, perlite with a particle diameter of 2mm or less is added to the mixture at the ratio of 60:40 (weight%), and is also subjected to kneading while adding water by a kneader in order to form particles having many small vacant spaces inside.

The said particles are fed into each of rolling drying rooms 2, 2... of the cylindrical rotating body 1 of a rotary drier, and the above-mentioned particles are dried by hot air while being slowly rolled and mixed in the rolling drying rooms 2, 2... by the rotating around the axis 3.

The dried material is sieved to obtain the particles of 1-5mm.



[Claims]

[Claim 1]

Toilet sand for pets constituted in the form of porous particles from the raw material obtained by adding perlite with a particle diameter of 3mm or less by 20-50% to the mixture of finely pulverized sodium bentonite with a swelling degree of 18 cc/2g or more (by the ACC method, same for the followings) and finely pulverized calcium bentonite, and by allowing addition of other components by not exceeding 15% to the mixture of those particles which are the main

components.

[Claim 2]

Toilet sand for pets constituted in the form of porous particles from the raw material obtained by adding perlite with a particle diameter of 3mm or less by 20-50% to the mixture of finely pulverized sodium bentonite with a swelling degree of 18 cc/2g or more and finely pulverized zeolite, and by allowing addition of other components by not exceeding 15% to the mixture of those particles which are the main components.

[Claim 3]

Toilet sand for pets constituted in the form of porous particles from the raw material obtained by adding perlite with a particle diameter of 3mm or less by 20-50% to the mixture of finely pulverized sodium bentonite with a swelling degree of 18 cc/2g or more (by the ACC method, same for the followings) and finely pulverized calcium bentonite, by adding resin with high water absorbency by 5% or less to the mixture of those particles which are the main components, and by allowing further addition of other components by not exceeding 15% to this resin with high water absorbency addition mixture.

[Claim 4]

Toilet sand for pets constituted in the form of porous particles from the raw material obtained by adding perlite with a particle diameter of 3mm or less by 20-50% to the mixture of finely pulverized sodium bentonite with a swelling degree of 18 cc/2g or more (by the ACC method, same for the followings) and finely pulverized zeolite, by adding resin with high water absorbency by 5% or less to the mixture of those particles which are the main components, and by allowing further addition of other components by not exceeding 15% to this resin with high water absorbency addition mixture.

[Description of the Invention]

[0001]

[Field of the Invention]

This invention relates to the toilet sand for pets used as bedding material for the toilets of pets, such as cats and dogs, and to its Production Method.

[0002]

[Prior Art]

Japan Patent Publication Heisei 5-8647 concerning the application of this applicant (henceforth called "the applicant's Conventional Example 1") offers excellent toilet sand for pets using conventional mineral substances and its Production Method.

The toilet sand of the applicant's Conventional Example 1 mentioned above has a high absorption of urine, etc., and the deodorizing function is also good, and moreover, it also has an economical efficiency and a good handling characteristic since only a small amount of toilet sand which absorbed urine becomes a lump and becomes hard when urine is added so that only this can be

thrown away.

Therefore, it is fully useful even now.

Moreover, its Production Method is, without a doubt, an outstanding method of easily producing porous particles.

[0003]

However, the toilet sand of the applicant's Conventional Example 1 mentioned above uses mineral bentonite as the raw material, and although it is constituted in porosity and the appearance specific gravity is reduced, it must be said that it still has a considerable appearance specific gravity.

It is rather difficult to always make this less than 0.7 by appearance specific gravity in production.

Although the appearance specific gravity is made sufficiently small when compared with the toilet sand before this, the toilet sand using paper or wood chips are proposed recently and some has even come to be produced, and it must be said that it is large when compared with these (of course, it is not necessary to mention that mineral substances are overwhelmingly superior to paper or wood chips in other basic performances as toilet sand).

[0004]

Thus, this applicant has developed the toilet sand which maintains high basic performances as toilet sand that the applicant's Conventional Example 1 mentioned above has, and further, which is itself light-weight and has a small specific gravity, and proposed this (Japan Unexamined Patent Publication Heisei 4-287626, henceforth called "the applicant's Conventional Example 2").

[0005]

In a brief sketch, this is toilet sand for pets constituted in the form of porous particles from the raw material obtained by adding foaming perlite with a particle diameter of 0.05mm - 2mm by 30% or less to finely pulverized natural bentonite which is the main component, and by allowing further addition of other components by 10% or less to these.

[0006]

Therefore, the applicant's Conventional Example 2 attained the effect of reduction in the appearance specific gravity while maintaining high performances in respect of the deodorizing function and the urine absorption function, and as a result, the weight of the same volume was reduced and the handling at the time of loading to and unloading from vehicles during shipping, conveying between warehouses and shop fronts during sales, conveying at home of the consumers, etc. was made easy.

Furthermore, by substantially reducing the weight of itself, reduction in the garbage weight generated after use of the toilet sand was obtained.

[0007]

Although the applicant's Conventional Example 2 is excellent as mentioned above, it turned out the problem that a lump-forming function by urine, that is, a function by which only the toilet sand

bonds mutually together and forms a lump when urine is applied, was somewhat unstable and the lumps sometimes collapse was found when the production was repeated.

[0008]

[Problem to be Solved by the Invention]

This invention seeks to correct this problem of the applicant's Conventional Examples mentioned above, i.e., an unstable lump-forming function by urine, and first aims at ensuring a stable function, and in addition, aims at strengthening much more other basic performances as toilet sand, i.e., the urine absorption and the deodorizing function.

[0009]

[Means to Solve the Problem]

Thus, the summary of Composition 1 of this invention is the toilet sand for pets constituted in the form of porous particles from the raw material obtained by adding perlite with a particle diameter of 3mm or less by 20-50% to the mixture of finely pulverized sodium bentonite with a swelling degree of 18 cc/2g or more (by the ACC method, same for the followings) and finely pulverized calcium bentonite, and by allowing addition of other components by not exceeding 15% to the mixture of those particles which are the main components, and thereby solving the above-mentioned problem.

[0010]

The summary of Composition 2 of this invention is the toilet sand for pets constituted in the form of porous particles from the raw material obtained by adding perlite with a particle diameter of 3mm or less by 20-50% to the mixture of finely pulverized sodium bentonite with a swelling degree of 18 cc/2g or more and finely pulverized zeolite, and by allowing addition of other components by not exceeding 15% to the mixture of those particles which are the main components, and thereby solving the above-mentioned problem.

[0011]

The summary of Composition 3 of this invention is the toilet sand for pets constituted in the form of porous particles from the raw material obtained by adding perlite with a particle diameter of 3mm or less by 20-50% to the mixture of finely pulverized sodium bentonite with a swelling degree of 18 cc/2g or more (by the ACC method, same for the followings) and finely pulverized calcium bentonite, by adding resin with high water absorbency by 5% or less to the mixture of those particles which are the main components, and by allowing further addition of other components by not exceeding 15% to this resin with high water absorbency addition mixture, and thereby solving the above-mentioned problem.

[0012]

Moreover, the summary of Composition 4 of this invention is the toilet sand for pets constituted in the form of porous particles from the raw material obtained by adding perlite with a particle diameter of 3mm or less by 20-50% to the mixture of finely pulverized sodium bentonite with a swelling degree of 18 cc/2g or more (by the ACC method, same for the followings) and finely pulverized zeolite, by adding resin with high water absorbency by 5% or less to the mixture of

those particles which are the main components, and by allowing further addition of other components by not exceeding 15% to this resin with high water absorbency addition mixture, and thereby solving the above-mentioned problem.

[0013]

Some additional explanations are given below about the above 1-4 of this invention.

As described above, the above-mentioned finely pulverized sodium bentonite needs to have a swelling degree of 18 cc/2g or more, and the one with that of 20 cc/2g or more is preferably used.

Since the toilet sand of this invention contains perlite at a large ratio, it tends to become difficult to obtain agglomeration of sufficient state as toilet sand as mentioned later.

Sodium bentonite with a high viscosity should be used for that reason, and the toilet sand which can agglomerate firmly will be obtained without losing the porosity in the process of toilet sand production by using the ones with about 18 cc/2g or more, preferably about 20 cc/2g or more, based on the swelling degree as mentioned above, and further by making the combination ratio larger, and moreover, the adhesive power between toilet sand at the time of applying urine will be strengthened, and a lump will be formed easily.

[0014]

By adjusting the combination ratio of the above-mentioned finely pulverized sodium bentonite and the finely pulverized calcium bentonite or the finely pulverized zeolite, the balance between the water absorbing function and the deodorizing function, the agglomeration power and the adhesive power at the time of absorbing water, i.e., the lump-forming function by urine can be adjusted.

[0015]

That is, when the ratio of the sodium bentonite with a high swelling degree as mentioned above is made larger, the lump-forming function by the urine of the obtained toilet sand can be strengthened.

Sodium bentonite - strengthens clumping

Agglomeration power at the time of creating particles as toilet sand can also be strengthened.

In addition, although agglomeration power at the time of creating particles as toilet sand can be strengthened with having only used sodium bentonite with a high viscosity, the lump-forming function by urine cannot be strengthened.

On the other hand, if the ratio of the calcium bentonite or zeolite is made larger, the water absorbing function and deodorizing function can be strengthened.

[0016]

Moreover, the above-mentioned perlite has an appearance specific gravity of about 0.15 in general, and the appearance specific gravity can be reduced significantly by mixing this in a large amount in the toilet sand of mineral substances and a good result can be attained in the water absorbing function, but it has no adhesive power at all.

calcium bentonite or zeolite - strengthens water absorbing & deodorizing function

Therefore, as described above, the characteristics of the sodium bentonite must be sufficiently considered.

That is, when mixing perlite at a large ratio, good sodium bentonite is selected on the basis of the above-mentioned swelling degree, and strengthening of the lump-forming function by urine and the adhesive power are aimed by making its ratio to the calcium bentonite or zeolite as large as needed. When the combination ratio of perlite is not so large, it is possible to make the combination ratio of the calcium bentonite or zeolite large.

[0017]

By the way, when the capability of the sodium bentonite which can come to hand is taken into consideration, the limit on the combination ratio of perlite is specifically about 50%, and it is difficult to attain a sufficient effect in reducing the appearance specific gravity when less than 20%.

[0018]

Therefore, on one hand, the combination ratio of the sodium bentonite and the calcium bentonite or zeolite should be adjusted in the viewpoint of attaining the capabilities as toilet sand (urine absorbency, deodorizing function, lump-forming function by urine, etc.) with an effective balance, and on the other hand, the combination ratio of the sodium bentonite and the calcium bentonite or zeolite should be further adjusted in relation to the combination ratio of the perlite added in the viewpoints of reducing the appearance specific gravity and other (mentioned later), as mentioned above.

In addition, the larger the combination ratio of perlite becomes, the higher the swelling degree of the selected sodium bentonite should be.

[0019]

In addition, since the reduction in the appearance specific gravity is also aimed by creating the toilet sand porous, this point must also be taken into consideration.

Moreover, it is appropriate to adopt the above-mentioned perlite which has a particle diameter of 3mm or less in relation with the size of the toilet sand particles to be created, as described above.

If it is 1mm or less, it is much more desirable.

[0020]

By the way, in 3 and 4 of this invention, 5% or less of resin with high water absorbency is added as a main component besides above as mentioned above, and supplementary explanation is given with regards to this.

It is not necessary to say that the urine absorbency will be improved remarkably by adding the above-mentioned resin with high water absorbency.

As the above-mentioned resin with high water absorbency, typical sorts can be used with no limitation.

The particle diameter of resin is desirably about 50-200 μ .

However, there is not much inconvenience otherwise.

[0021]

Specifically, as such compounds, there are polyacrylic acid salt cross-linked thing, starch - acrylic acid salt cross-linked thing, ester acrylate, saponification thing of vinyl acetate copolymer, acrylic acid salt - acrylamide copolymer cross-linked thing, polyoxy ethylene cross-linked thing, etc.

In addition, water absorbing of ability these is desirably about 200-800 times.

If water absorbing ability is too high, the moisture which should be applied to other components will be taken away when creating particles for toilet sand, and if it is too low, it will not be helpful to the improvement in the water absorbing function.

[0022]

Moreover, as the components other than the main components comprising above-mentioned sodium bentonite, the above-mentioned calcium bentonite or the above-mentioned zeolite, the above- mentioned perlite in 1-4 of this invention as well as the resin with high water absorbency in 3 and 4 of this invention, various deodorants, fragrances, disinfectants, etc. can be mixed as mentioned above.

An adhesion auxiliary agent may also be added depending on the case.

However, for most of the adhesion auxiliary agents currently sold as a medicine, there is a high possibility that firm agglomeration may occur by adding these and viscosity may not be generated, that is, the lump-forming function by urine may be lost, a sufficient caution is required for its employment.

[0023]

As described above, components other than the above-mentioned main components can be mixed only in the range not exceeding 15%.

When this is exceeded, a bad influence arises in formation of the lump at the time of absorbing urinary moisture, the increase in the appearance specific gravity is brought about, or there is a possibility of becoming a toxic substance after use and not being able to throw it away in fields etc.

[0024]

The toilet sand for pets described above is produced by mixing the finely pulverized sodium bentonite and a finely pulverized calcium bentonite or finely pulverized zeolite at a suitable ratio according to the above-mentioned conditions, adding perlite of 20-50% to this, and further adding

the resin with high water absorbency of 5% or less into the mixture of those particles that are the main components in the cases of 3 and 4 of this invention, similarly mixing a mineral substance with a high water absorbing function and/or deodorizing function, a suitable adhesion auxiliary agent, a deodorant, a water absorbing agent, a fragrance, etc., in the range not exceeding 15% as needed in any case, and creating porous particles in the state where pressure is applied as little as possible.

The appearance specific gravity should be made 0.5 or less.

If possible, it should be about 0.4.

The appearance specific gravity of the natural bentonite simply pulverized is about 0.95.

The size of sand particle to be created is suitably about 1mm - 5mm in diameter.

Even if the particle diameter is larger than this a little, there is not much problem.

[0025]

Two suitable examples to produce the porous toilet sand for pets of 1-4 of this invention are explained.

The first method first produces a raw material mixture by mixing the required components as the above-mentioned toilet sand, kneads the above-mentioned raw material mixture with a kneading means while adding water, inserts the particles generated by the above-mentioned kneading into each of the below-mentioned rolling drying rooms of a cylindrical rotating body of which the inside is divided into multiple rolling drying rooms of a form of cross-sectional sectors at a constant angle interval, makes the above-mentioned cylindrical rotating body rotate, dries the particles inserted into the rolling drying rooms by hot air while slowly rolling them inside, and makes them porous particles.

[0026]

The second method first produces a raw material mixture by mixing the required components as the above-mentioned toilet sand, kneads the above-mentioned raw material mixture with a kneading means while adding water, puts the particles generated by the above-mentioned kneading onto a mesh plate, dries the particles by hot air from below while giving vibration to the above-mentioned mesh plate in a way that the particles on the plate move in a fixed direction, and makes them porous particles.

[0027]

The above two Production Methods are explained more in detail.

In both cases, the raw material mixture is inserted in a kneader etc. and about 45-60% of water is added to the raw material mixture while kneading.

The quantity of water is not limited to this, but determined while observing this kneading state.

That is, since particles are formed shortly after adding water to the raw material mixture while kneading by a kneader etc., supply of water is adjusted so that the diameter does not exceed about 5mm.

This kneading is continued until the water supply situation is equalized and equalized particles come to be formed.

If this kneading is by a kneader, several steps are repeated if needed.

Since the particles formed at this time are formed by kneading without applying pressure, it becomes porous with many vacant spaces inside.

[0028]

Subsequently, the particles generated as mentioned above are inserted into a rotary drier in a suitable quantity one after another, and are dried gradually by sending hot air in while being rolled the Production Method 1 mentioned above.

As mentioned above, the cylindrical rotating body which constitutes the rotary drier is divided into multiple rolling drying rooms of a form of cross-sectional sectors at a constant angle interval in the inside, and the above-mentioned particles are inserted into each of the rolling drying room, the above-mentioned cylindrical rotating body is made to rotate, and it dries the particles inserted into the above-mentioned rolling drying rooms by sending hot air in while making the particles roll inside.

By drying the particles in a way that only the minimum pressure is applied like this, porous particles are constituted without fattening the above-mentioned particles and without applying pressure.

[0029]

Moreover, in the case of the above-mentioned Production Method 2, the particles generated by the above-mentioned kneading are put onto a mesh plate and dried by sending hot air from below while giving vibration to the above-mentioned mesh plate in a way that the particles on the plate move in a fixed direction, and makes them porous particles, as mentioned above.

Similarly, by drying the particles in a way that only the minimum pressure is applied like this, porous particles are constituted without fattening the above-mentioned particles and without applying pressure.

[0030]

As mentioned above, it can create the particles which have many vacant spaces inside very easily only by first kneading the raw material mixture while adding water without applying pressure in both cases.

After that, the Production Method 1 aims at maintaining the porosity by drying using hot air while reducing the pressure or shock from the outside as much as possible by making the fall height in the cylindrical rotating body at the time of rotation when the above-mentioned particles are

inserted in multiple sections of a form of cross-sectional sectors in the cylindrical rotating body.

Moreover, the Production Method 2 aims at certainly maintaining the porosity by not at all adding any pressure from the outside by drying using hot air while making the mesh plate top rolling.

The dry particles are sieved and the ones with a particle diameter of, for example, about 1-5mm are obtained.

[0031]

[Action]

Therefore, this toilet sand for pets of 1 of this invention is used as bedding material of a pet's toilet like those generally used.

In such a case, since this itself is constituted to have porosity, the water absorbing function is very high and has about 100-111% of water absorption capability.

When compared with the natural bentonite particles which are only simply pulverized, the water absorbing function is improved by about 3.5 times, and when compared with the toilet sand for pets of the applicant's Conventional Example 1 mentioned above, it has the water absorbing function of about 1.75-1.94 times.

When compared with the applicant's Conventional Example 2, it is improved by about 1.3-1.44 times.

[0032]

Since 3 and 4 of this invention further contain the resin with high water absorbency as the composition element, the water absorbency is much better, and when compared with the applicant's Conventional Example 2 mentioned above, it is improved by about 1.6 times.

Since the water absorbing function improved so much, pets' urine will be absorbed well and urine will be certainly confined in the inside of the toilet sand.

Moreover, it has almost the same deodorizing capability as zeolite of the same amount.

[0033]

Moreover, when moisture is added, strong adhesive power arises in the particles of the toilet sand that absorbed the moisture, and adjoining sand mutually solidifies in the shape of a lump.

Therefore, only the toilet sand which absorbed urine can easily be removed selectively.

Moreover, since the ones by the cases of 1 and 2 of this invention has the water absorbing function 3.5 times better when compared with the natural bentonite particles which are only pulverized as mentioned above, it is very economical because only about 30% of toilet sand ought to be removed and thrown away compared to this.

Further with the toilet sand of 3 and 4 of this invention, toilet sand as less as about 24% is removed and thrown away.

[0034]

Since the toilet sand for pets of 1-4 of this invention will not remain for having created particle to porosity but perlite will be included about 20-50%, 0.5 or less is the appearance specific gravity.

Therefore, if compared with it of particles of a mere natural bentonite, it will be below a half and handling will become easy very much on shipping and discharging in transportation, movement in the exhibition position in selling Tang, and carrying of a purchaser and movement at home.

[0035]

Moreover, after using the toilet sand for pets of 1-4 of this invention as bedding material of a pet's toilet, this can be given to fields as it is, and it can also be used as soil improvement material which aims at neutralization of acid soil, and improvement in drainage nature, it can mix to a compost, and it can also aim at improvement in the characteristics.

Therefore, it also has the advantage referred to as that it does not increase waste since this toilet sand for pets can use after use useful.

Furthermore, since the specific gravity is decreasing a reduction by half or more than it when throwing away as waste, there is also an advantage referred to as decreasing the used toilet sand as waste.

[0036]

Although the toilet sand for pets of the above 1-4 of this invention can be produced by various methods, it can be more efficiently obtained by the above-mentioned Production Method of 1 and 2 with good quality.

That is, according to the above-mentioned Production Method of 1 and 2, the particles can be made to have many vacant spaces inside by creating particles without applying pressure to the raw material mixture.

Furthermore, since shock or pressure is given to the particles in the later drying process as little as possible, the vacant spaces produced at the particle creation process are not lost, and toilet sand with a very small appearance specific gravity can be obtained.

[0037]

[Execution Examples]

Execution Example 1

Sodium bentonite and calcium bentonite which were finely pulverized were mixed at a ratio of 1:1, and perlite was added to the powder bentonite mixture.

The ratio was set to powder bentonite mixture: perlite = 60:40 (weight%).

In addition, the above-mentioned sodium bentonite adopted had a swelling degree of 22 cc/2g, and the above-mentioned perlite adopted had a particle diameter of 2mm or less.

The raw material mixture obtained in this way was inserted into a kneader and was kneaded, and water was added while continuing kneading further at the stage where the mixture state became good.

When water was added while observing the progress state of becoming particles, the ratio of added water became 50% to the above-mentioned raw material mixture.

The raw material mixture which came to contain water in the kneader changed into particles of several sizes which has many small vacant spaces inside during the process of kneading.

[0038]

Subsequently, the above-mentioned particles containing water were inserted into a rotary drier one after another, and were dried by hot air while being rolled.

The cylindrical rotating body 1 of the above-mentioned rotary drier had its inside divided into multiple rolling drying rooms 2, 2... of a form of cross-sectional sectors at a constant angle interval as shown in Fig. 1, the above-mentioned particles containing water were inserted into each of the above-mentioned rolling drying rooms 2, 2... of the above-mentioned cylindrical rotating body 1, the above-mentioned cylindrical rotating body 1 was made to rotate around its axis 3, and the above-mentioned particles inserted in the above-mentioned rolling drying rooms 2, 2... were dried by sending hot air in while being rolled slowly inside.

[0039]

Since the particles moved only in each of the above-mentioned rolling drying rooms 2, 2... in this way at the time of rotation of the cylindrical rotating body 1, the fall at the time of rolling became small, consequently making the shock by fall small, and many small vacant spaces in the inside were not lost.

The above-mentioned particles dried by hot air were sieved to isolate the particles of 1-5mm after that.

The remaining particles of 1-5mm were used as the toilet sand for pets.

[0040]

Execution Example 2

Sodium bentonite and zeolite which were finely pulverized were mixed at a ratio of 2:3, and perlite was added to the powder bentonite mixture.

The ratio was set to powder mixture: perlite = 69.9:30 (weight%).

A disinfectant and a fragrance of 0.1% in total are combined with the mixture to which the

above-mentioned perlite added.

In addition, the above-mentioned sodium bentonite adopted had a swelling degree of 22 cc/2g, and the above-mentioned perlite adopted had a particle diameter of 2mm or less.

The raw material mixture obtained in this way was inserted into a kneader and was kneaded, and water was added while continuing kneading further at the stage where the mixture state became good.

When water was added while observing the progress state of becoming particles, the ratio of added water became 48% to the above-mentioned raw material mixture.

The raw material mixture which came to contain water in the kneader changed into particles of several sizes which has many small vacant spaces inside during the process of kneading.

[0041]

Subsequently, the above-mentioned particles containing water 4, 4... were put on the mesh plate 5 one after another as shown in Fig. 2, and vibration was further given to the above-mentioned mesh plate 5 in a way that the particles 4, 4... put on this moved in a fixed direction.

In addition, hot air was sent from below and the above-mentioned particles 4, 4... were dried.

Since the particles 4, 4... were dried by hot air while being rolled in this way and there was not shock applied, the drying was completed without losing the vacant spaces in the inside.

The above-mentioned particles 4, 4... dried by hot air were sieved to isolate the particles of 1-5mm at the end.

The remaining particles 4, 4... of 1-5mm were used as the toilet sand for pets.

[0042]

Execution Example 3

Sodium bentonite and calcium bentonite which were finely pulverized were mixed at a ratio of 1:1, and powder of perlite and polyacrylic acid salt cross-linked thing was added to the powder bentonite mixture.

The ratio was set to powder bentonite mixture: perlite: polyacrylic acid salt cross-linked thing = 69:30:1 (weight%).

In addition, the above-mentioned sodium bentonite adopted had a swelling degree of 22 cc/2g, and the above-mentioned perlite adopted had a particle diameter of 2mm or less.

Moreover, the above-mentioned polyacrylic acid salt cross-linked thing adopted was powder with a size of 100 μ .

[0043]

The raw material mixture obtained in this way was inserted into a kneader and was kneaded, and water was added while continuing kneading further at the stage where the mixture state became good.

When water was added while observing the progress state of becoming particles, the ratio of added water became 50% to the above-mentioned raw material mixture.

The raw material mixture which came to contain water in the kneader changed into particles of several sizes which has many small vacant spaces inside during the process of kneading.

[0044]

Subsequently, the above-mentioned particles containing water were inserted into a rotary drier one after another, and were dried by hot air while being rolled.

The cylindrical rotating body 1 of the above-mentioned rotary drier used was that of the Execution Example 1, and its inside was divided into multiple rolling drying rooms 2, 2... of a form of cross-sectional sectors at a constant angle interval as shown in Fig. 1, the above-mentioned particles containing water were inserted into each of the above-mentioned rolling drying rooms 2, 2... of the above-mentioned cylindrical rotating body 1, the above-mentioned cylindrical rotating body 1 was made to rotate around its axis 3, and the above-mentioned particles inserted in the above-mentioned rolling drying rooms 2, 2... were dried by sending hot air in while being rolled slowly inside.

[0045]

Since the particles moved only in each of the above-mentioned rolling drying rooms 2, 2... in this way at the time of rotation of the cylindrical rotating body 1, the fall at the time of rolling became small, consequently making the shock by fall small, and many small vacant spaces in the inside were not lost.

The above-mentioned particles dried by hot air were sieved to isolate the particles of 1-5mm after that.

The remaining particles of 1-5mm were used as the toilet sand for pets.

[0046]

Reference Example 1

Finely pulverized sodium bentonite was inserted to the first step of a kneader, and water was added while kneading.

The ratio of water added was 25% to the finely pulverized sodium bentonite.

The finely pulverized sodium bentonite which came to contain water in the kneader became particles of several sizes.

The particles obtained in this way were moved from the above-mentioned first step of the kneader to the second step of the kneader, and was kneaded further.

Then, the above-mentioned particles containing water were inserted into the cylindrical rotating body of a rotary drier one after another, and were dried by hot air while being rolled.

Subsequently, the above-mentioned particles dried by hot air were sieved to isolate the particles of 1-5mm.

[0047]

Reference Example 2

Sodium bentonite and calcium bentonite which were finely pulverized were mixed at a ratio of 1:1, and perlite was added to the fine powder bentonite mixture.

The ratio was set to fine powder bentonite mixture: perlite = 85:15 (weight%).

In addition, the above-mentioned perlite adopted had a particle diameter of 0.1-1mm.

The raw material mixture obtained in this way was inserted into a kneader, and water was added while kneading.

The ratio of water added became 30% to the above-mentioned raw material mixture.

The raw material mixture which came to contain water in the kneader changed into particles of several sizes which has many small vacant spaces inside during the process of kneading.

[0048]

Subsequently, the above-mentioned particles containing water were inserted into a rotary drier one after another, and were dried by hot air while being rolled.

Subsequently, the above-mentioned particles dried by hot air were sieved at the end to isolate the particles of 1-5mm.

The remaining particles of 1-5mm were used as the toilet sand for pets.

[0049]

Reference Example 3

This was commercial toilet sand for pets and it was natural bentonite which was only pulverized by a pulverization machine.

[0050]

Next, the examination results about the characteristics of the Execution Example 1, 2, 3 and the Reference Example 1, 2, and 3 are shown in Table 1 and 2.

[0051]
 [Table 1]

Item	Water absorbing function		Solidification characteristic	
	Amount required to absorb water 20cc(g)	Absorptivity (%)	Result of pushing the lump with a finger immediately after adding water	Result of pushing after 48Hr of adding water
Execution Example 1	18.0	111.1	Crushed without collapsing.	Collapsed and became like a board.
Execution Example 2	20.0	100.0	Crushed without collapsing.	Collapsed and became like a board.
Execution Example 3	16.0	125.0	Crushed without collapsing.	Collapsed and became like a board.
Reference Example 1	35.0	57.1	Crushed without collapsing.	Collapsed and became like a board.
Reference Example 2	26.0	76.9	Crushed and collapsed a little.	Crushed and collapsed a little.
Reference Example 3	66.0	30.0	Collapsed and returned to particles.	Collapsed and returned to particles.

[0052]
 The water absorbing function and solidification characteristic in the above-mentioned table 1 are as follows.

Water absorbing function: The samples were put into beakers, 20 cc of water was poured in, the weight of the solidified portion was measured, and the weight of water was deducted from this weight.

Solidification characteristic: The lumps of the samples obtained by the examination of the water absorbing function 1 were pinched with fingers to give pressure, and the way they were crushed or the way they collapsed was observed.

[0053]
 [Table 2]

Item	Appearance specific gravity	Ph	Deodorizing function (ppm)	
			After 10 minutes	After 20 minutes
Execution Example 1	0.40	8.5	50	30
Execution Example 2	0.45	8.0	40	20
Execution Example 3	0.40	8.5	40	20
Reference Example 1	0.75	9.0	50	30
Reference Example 2	0.55	8.5	60	35
Reference Example 3	0.95	10.0	230	80

[0054]

In the above-mentioned table 2, the deodorizing function is as follows.

Deodorizing function: 20g of the samples were put into 300ml Erlenmeyer flasks, 0.1g of 10% ammonia solution was dripped in these, and these were sealed immediately.

After 10 minutes and 20 minutes, the remaining concentration of the ammonia gas in the flasks was measured with the gas detection pipe, respectively.

[0055]

Thus, the toilet sand obtained in the above Execution Examples has the following characteristics.

The water absorbing function is very high and it has the water absorbing function of about 100% - 125% of its weight.

When compared with the applicant's Conventional Example 1 mentioned above shown as the Reference Example 1, the Execution Example 1 and 2 have the water absorptivity of about 1.75-1.94 times and the Execution Example 3 has that of about 2.18 times. When compared with the applicant's Conventional Example 2 mentioned above shown as the Reference Example 2, the Execution Example 1 and 2 have that of about 1.3-1.44 times and the Execution Example 3 has that of about 1.62 times. Moreover, when compared with the toilet sand for pets which was only pulverized shown as the Reference Example 3, even the Execution Example 2 which has the smallest water absorptivity has that of about 3.3 times.

[0056]

Since urine is confined in the inside of the toilet sand as a result of a very high absorbing function, a deodorization effect thus arises similarly.

Moreover, if urinary moisture is poured, adhesive power arises, and adjoining particles mutually bond together in an instant and generate a lump.

And this does not collapse easily even after a while.

This invention differs from the Reference Example 2 on this point, and this difference is very big for practical use.

[0057]

The appearance specific gravity of the toilet sand of each Execution Example of this invention is 0.4-0.45.

Since the Reference Example 1 has that of 0.75, it is 60% or less.

It is about 80% as compared with the Reference Example 2, and as compared with the Reference Example 3, it is 50% or less.

Moreover, the toilet sand after use can be thrown into fields, and can achieve pH adjustment, improvement in drainage nature, and other soil improvement actions.

It can be added to compost and can also be used for its improvement.

Thus, there is no need to throw it away.

[0058]

It was used by covering with a thickness of about 5-6cm a box-shaped toilet for pets having an area of 40cmX40cm and a depth of 10cm, it was very good as mentioned above in any viewpoint of urine absorbing function, deodorizing function, and lump-formation by urine.

The toilet sand after use was put in fields, and good results have been reported.

[0059]

[Effect of the Invention]

As compared with conventional it, the toilet sand for pets of this invention has high absorption, and its deodorizing function is also overwhelmingly powerful.

Furthermore, it has deodorizing function comparable as the zeolite of the amount of said.

Moreover, lump-formation by urine etc. arises immediately and it does not collapse easily by progress of time.

So, selective removal of only the portion which absorbed urine is easy, and economical.

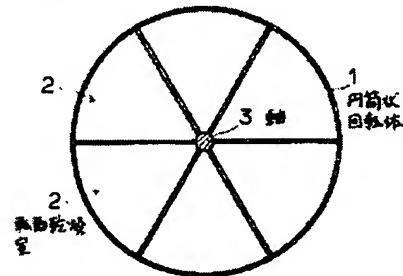
Moreover, since specific gravity is very small, a burden is not applied to movement, carrying of a buyer, etc. by shipping and discharging on conveyance, and store.

In addition, since the toilet sand after use can also be used for soil improvement material, such as fields, there is no necessity for throwing away.

Moreover, since it sees and specific gravity is small when throwing away reluctantly, the weight which should be thrown away will become very light-weight.

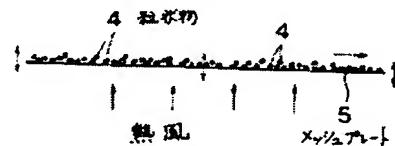
[Brief Explanation of the Drawings]

[Figure 1]



The outline sectional diagram of the cylindrical rotating body of the rotary drier used by the Execution Example 1.

[Figure 2]



The outline diagram showing the drying process by hot air of the Execution Example 2.

[Explanation of the Marks]

1. Cylindrical rotating body
2. Rolling drying room
3. Axis
4. Particles
5. Mesh plate